

following: SHULL, C. A., Measurement of the surface forces in soils. BOT. GAZ. 62:1-31. 1916.

The final chapter is devoted to a theoretical discussion of soil analysis. An appendix describes analytical methods used in England. The reviewer believes that the reader should be cognizant of the following discussions of American methods: BEAR, F. E., and SALTER, R. M., Methods in soil analysis (Technical Bulletin). Bull. 159. West Virginia Agric. Exper. Sta. Morgantown. 1916; AMES, J. W., and SCHOLLENBERGER, C. J., Liming and lime requirement of soil. Bull. 306. Ohio Agric. Exper. Sta. Wooster. 1916; TRUOG, E., A new test for soil acidity. Bull. 249. Wisconsin Agric. Exper. Sta. Madison. 1915; BOUYOCOS, GEO. J., and MCCOOL, M. M., The freezing point method as a new means of measuring the concentration of the soil solution directly in the soil. Tech. Bull. 24. Michigan Agric. Exper. Sta. East Lansing. 1915.—H. L. WALSTER.

MINOR NOTICES

History of phytopathology.—WHETZEL,² in his *History of phytopathology*, aims "only to set forth in outline what appear to be the most outstanding features in the evolution of the science, and to indicate the proper relation thereto of the men who have chiefly shaped its progress." The chief captions are: (1) The Ancient Era, to the end of the 5th century (5 pp.); (2) The Dark Era, 6th to 16th centuries (1 p.); (3) The Premodern Era, 1600 to about 1850 (19 pp.); (4) The Modern Era, 1853 to about 1906 (65 pp.); (5) The Present Era, 1906 (8 pp.). As is indicated by the page allotment, the first and second topics are treated very briefly, being barely sketched. The third and fifth topics are treated somewhat more fully, while the most page space is given to "The Modern Era." The book is in the main a series of brief biographical sketches, often with portraits, arranged chronologically under the captions indicated. It will be a convenient reference book for those who may need ready access to such biographies.—F. L. STEVENS.

Winter botany.—To supplement his pocket manual of woody plants, already noted in this journal,³ TRELEASE⁴ has compiled and published a companion volume for use in naming our common trees and shrubs when without foliage. The range, extending to 326 genera and over 1000 species, includes most introduced as well as native woody plants. The notable features of the volume, aside from its convenient pocket size and abundant illustrations from most accurate drawings, are the numerous keys and the many citations of literature dealing with winter characters of the various genera and species. The

² WHETZEL, H. H., An outline of the history of phytopathology. pp. 130. Saunders Co. 1918.

³ BOT. GAZ. 65:194. 1918.

⁴ TRELEASE, WILLIAM, Winter botany. 16mo. pp. 394. figs. 327. Urbana, Ill. Published by the author. 1918. \$2.50.

drawings are of bud, leaf-scar, pith, and other twig characters upon which the keys are based, so that with the use of a hand lens it should be possible to determine readily the genera, and for the most part the species, for native and introduced trees and shrubs. The author is to be congratulated in making such a fund of unusual information available in such a compact and readily available form.—GEO. D. FULLER.

American trees.—Another book on trees, by EMERSON and WEED,⁵ has been added to the already large number upon the same subject. It is essentially a book for the amateur, since its chief virtue lies in the excellent photographs by EMERSON, an entire page being devoted to each species. The absence of keys of any sort renders the book comparatively useless for the identification of an unknown species, but the quality and abundance of the illustrations will make it one the tree lover will wish to have upon his table.—GEO. D. FULLER.

NOTES FOR STUDENTS

Physiological balance in soil and other nutrient solutions.—HIBBARD⁶ has just published a piece of work on physiological balance in soil solution which is to mark a decided advance (both theoretically and practically), if the future development of the work approximates its present promise. He extracted the soil solution from an infertile very sandy soil and from a fertile sandy loam by the Van Suchten oil pressure method as improved and extended in usefulness by MORGAN.⁷ HIBBARD speaks of this as giving a more concentrated solution than any other extraction method. The solution thus extracted from the poor sandy soil had an osmotic pressure of 0.193 atmospheres, and that from the good soil 1.81 atmospheres. The soil extracts showed an order of production similar to the soils from which they came.

The soil extracts were used instead of distilled water to prepare the Shive 3-salt (KH_2PO_4 , $\text{Ca}(\text{NO}_3)_2$, MgSO_4) nutrient solution. The total concentration of nutrient salts added gave an osmotic pressure of 1.75 atmospheres, and in the 36 different solutions made up from each soil extract and from distilled water the proportions of each salt varied from 10 to 80 per cent of the total nutrient salt osmotic concentration.

In the nutrient solution made from the extract of the poor soil the optimum osmotic proportions of the KH_2PO_4 , $\text{Ca}(\text{NO}_3)_2$, and MgSO_4 for the growth of Fultz wheat were 7:1:2 respectively, with a total osmotic pressure of (1.75 + 0.193) 1.94 atmospheres; in that made from the extract of the good soil 2:7:1 respectively, with a total osmotic pressure of (1.75 + 1.81) 3.56 atmospheres; and in that made with distilled water 5:2:3, with a total osmotic pressure of

⁵ EMERSON, ARTHUR I., and WEED, C. M., *Our trees, how to know them.* New ed. pp. xxi+295. *pls.* 149. Philadelphia: Lippincott Co. \$3.50.

⁶ HIBBARD, R. P., *Physiological balance in the soil solution.* Tech. Bull. Mich. Agric. Exper. Sta. no. 40. pp. 44. 1917.

⁷ Tech. Bull. Mich. Agric. Coll. Exp. Sta. no. 28.